

A peculiar new species of *Scutisotoma* Bagnall, 1949 (Collembola: Isotomidae) from Brazil

Maria Cleide de Mendonça* and Tatiana Christina da Silveira

Department of Entomology, National Museum, Federal University of Rio de Janeiro, Quinta da Boa Vista s/n, São Cristóvão, 20940-040, Rio de Janeiro, RJ, Brazil

* Corresponding author, e-mail: cleidecollembola@gmail.com

Received 5 December 2018 | Accepted 4 February 2019

Published online at www.soil-organisms.de 1 April 2019 | Printed version 15 April 2019

DOI 10.25674/so-91-1-01

Abstract

Samples collected from the National Park of Caparaó, in Minas Gerais state, revealed the presence of a new species *Scutisotoma misha* n. sp., which is distinguished from other congeners species by having a peculiar set of characters: simple maxillary palp, the absence of the labial guard chaetae e_7 , Ant. III without bms, 5,4/3,3,3,3,5 tergal sensilla (including 1,1/1,1,1 microsensilla) and one spatulate tenent chaeta on each tibiotarsus. In the present work the genus *Scutisotoma* Bagnall, 1949 is recorded for the first time in Brazil.

Keywords Biodiversity | Neotropic | springtail | taxonomy

1. Introduction

The genus *Scutisotoma* was proposed by Bagnall (1949), with *Proisotoma titusi* (Folsom, 1937) as the type species. For a long time, the genus was considered a synonym of *Proisotoma* Börner, 1901 based on the traditional diagnosis adopted at that time. In relevant works on *Proisotoma*, Fjellberg (1993) and posteriorly Potapov et al. (2006) included *Scutisotoma*, *Proisotoma* and 4 other genera in a group named *Proisotoma* complex. According to these authors, this complex was based on a variable reduction of the furcula, rarely to total absence, or few anterior chaetae on manubrium and two last abdominal segments clearly separated. In this work, Potapov et al. (2006) analyzed essential diagnostic characters, such as the number and distribution of tergal sensilla, position of the sensilla in relation to the p-row of chaetae on Th. II – Abd. III, antennal sensilla, number of chaetae on ventral tube and tibiotarsal chaetae. Based on these characters, the new genus *Strenzetoma* was described and the status of *Scutisotoma*, *Proisotoma*,

Ballistura Börner, 1906, *Subisotoma* Stach, 1947, and *Weberacantha* Christiansen, 1951 were redefined. In *Scutisotoma*, 14 new species were included and 14 new combinations of species previously allocated in *Proisotoma* were made.

Scutisotoma comprises 33 nominal species (Bellinger et al. 2019) recorded from Palearctic and Nearctic regions, and only two: *Scutisotoma titusi* (Folsom, 1937), occurring even further south, with records for Idaho (Wray 1950), Mexico, according to Hepburn & Ross (1964) and California (Christiansen & Bellinger 1980) and *S. variabilis* (Gisin, 1949) to Central America (Bellinger et al. 2019).

This study presents the first record for the genus in Brazil. *Scutisotoma misha* n. sp., here described and illustrated, was found in soil and leaf-litter from a high altitude ecosystem in Serra do Caparaó (2.800 m a.s.l.), State of Minas Gerais.

2. Material and methods

Collembola were extracted using Berlese-Tullgren funnels, sorted under a stereomicroscope and mounted on glass slides according to Arlé & Mendonça (1982). Illustrations were made using a drawing tube on optic microscope. The type material was deposited in the Collembola Collection of the Entomology Department, Museu Nacional/UFRJ, Rio de Janeiro, RJ, Brazil (acronym CM/MNRJ). The nomenclature of dorsal chaetotaxy follows the chaetal system (Potapov et al. 2006); mouth region chaetotaxy (Fjellberg 1999); antennal, tibiotarsal and furcal chaetotaxy (Potapov et al. 2006).

Abbreviations: Abd – abdominal segments; Ant – antennal segment; a.s.l. – above sea level; bms – basal microsensillum; ICMBio – Instituto Chico Mendes da Biodiversidade; ms – microsensillum; PAO – postantennal organ; s – sensillary chaetae; Th – thoracic segments; Tita – tibiotarsus; ES – Espírito Santo State; MG – Minas Gerais State; NPC – National Park of Caparaó.

3. Results

Genus *Scutisotoma* Bagnall, 1949

Diagnosis (after Potapov et al. 2006). All segments separated. Color usually present. All microsensilla present (1,1/1,1,1). Ocelli 5–8. PAO oval. Ant. I–III with full set of bms or without bms on Ant. III. Maxillary palp bifurcated, rarely simple. Labial papilla E with a full set of guards, rarely e, absent. Thorax without ventral chaetae. Ventral tube with 4 + 4 laterodistal chaetae and two or more posterior chaetae. Unguis simple, without teeth. Tita I–II with B-row complete. Tibiotarsal tenent

chaetae clavate or truncate (1,2,2 or rarely 1,1,1). Furca in various stages of reduction. Manubrium with a pair of distal chaetae on anterior side. Dens with chaetae arranged along or only on distal part. Mucro with 2–3 teeth, often lamellate, rarely absent.

Scutisotoma misha n. sp. (Figs 1–21)

Type material: Holotype: female on slide (N° 2448 d CM/MNRJ), 2013, Silveira T.C. leg. Paratypes: 20 specimens on slides 2448a CM/MNRJ, 2448b CM/MNRJ, 2448c CM/MNRJ, 2448e CM/MNRJ, 2448f CM/MNRJ, 2448g CM/MNRJ, 2448h CM/MNRJ, 2448i CM/MNRJ, 2448j CM/MNRJ, 2448k CM/MNRJ, 2448l CM/MNRJ 19/XI/2013, Silveira, T.C. leg. Paratypes: 365 specimens in ethanol (N° 2448 CM/MNRJ) 19/XI/2013, Silveira T.C. locality the same as holotype

Type locality: National Park of Caparaó (ICMBio), Alto Caparaó municipality, Minas Gerais state, Brazil (Fig. 1A). Soil and vegetation of high altitude ecosystem that belongs to the Atlantic Forest biome, where the species of genus *Chusquea* Kunth, *Cortaderia* Stapf (Poaceae), *Baccharis* Linnaeus (Asteraceae) and *Myrsine* Linnaeus (Primulaceae) stand out. The dark soil suggests presence of peat (peat high altitude) (Fig. 1B). Local coordinates: 22°27'10.75"S, 41°48'4.76"W. About 2.400 m a.s.l.

3.1 Description

Body size 0.75–0.86 mm. Habitus elongated like the members of *Proisotoma*. Overall color brownish; ventral side of body, legs and furcula paler (Fig. 2). Cuticle with fine primary granulation. All body segments separated. Ocelli 8 + 8 in dark pigmented eye patch; G and H smaller. PAO

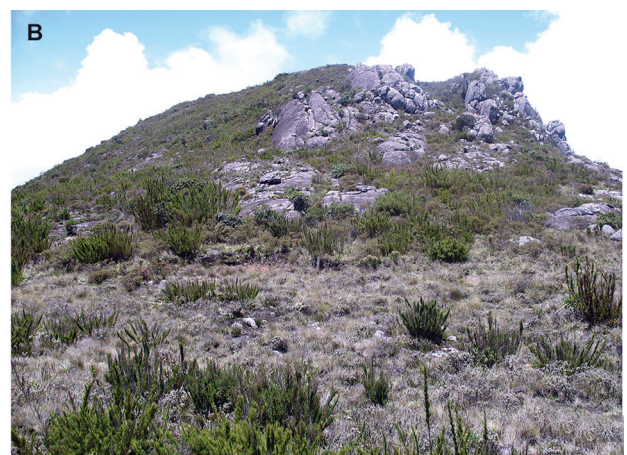
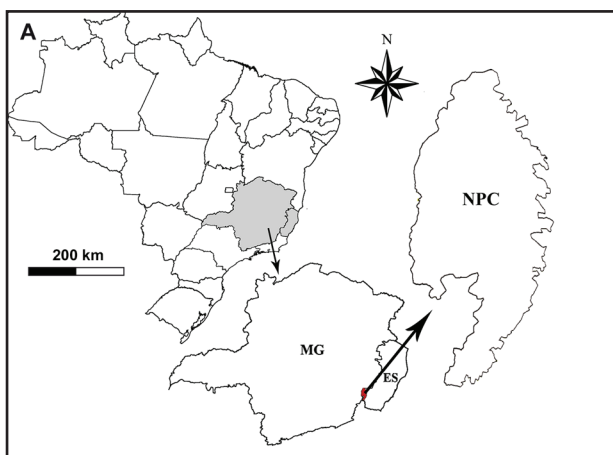


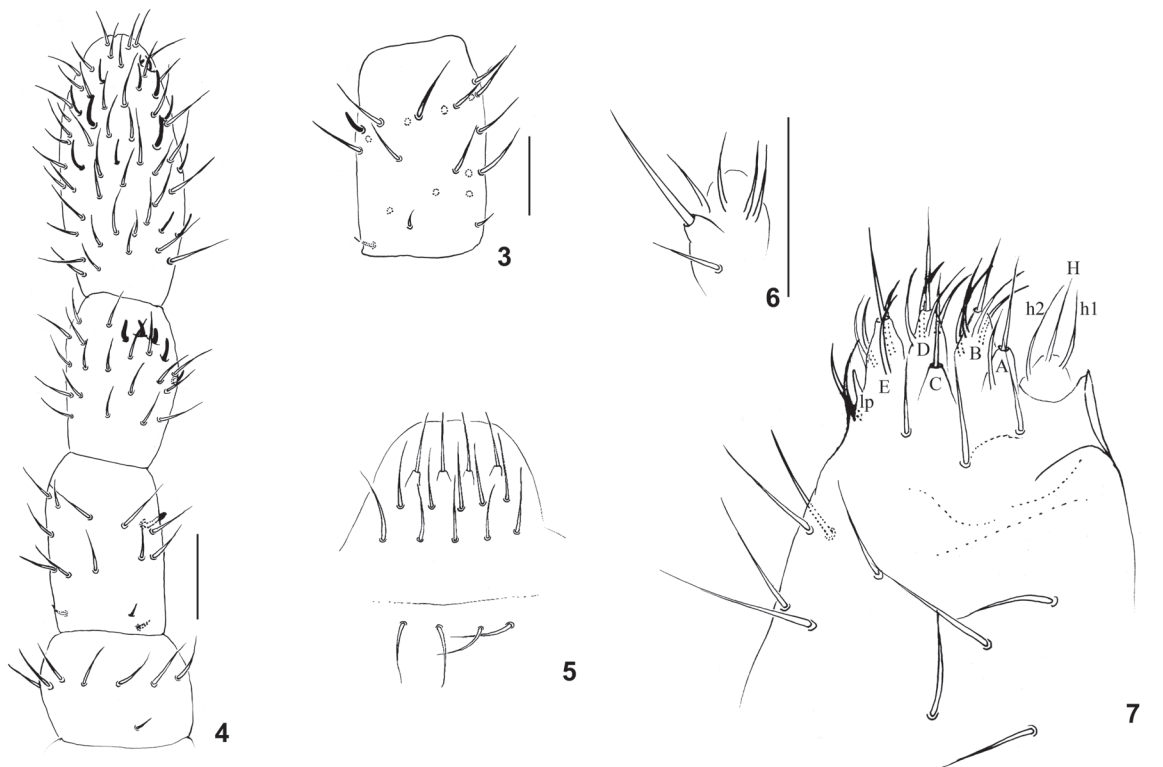
Figure 1. Location and landscape of the type locality. (A) Location of the National National Park of Caparaó. (B) Typical landscape of a high altitude ecosystem of Brazilian Southeast mountains where *Scutisotoma misha* n. sp. was collected.

elongated with light constriction, 3 surrounding chaetae at posterior edge, measuring three times the size of one ocellus. Ant IV with subapical small organite on dorsal side, protected by 1 curved chaeta, and about ten sensilla, some of them weakly differentiated. Ant. III with about 26 ordinary

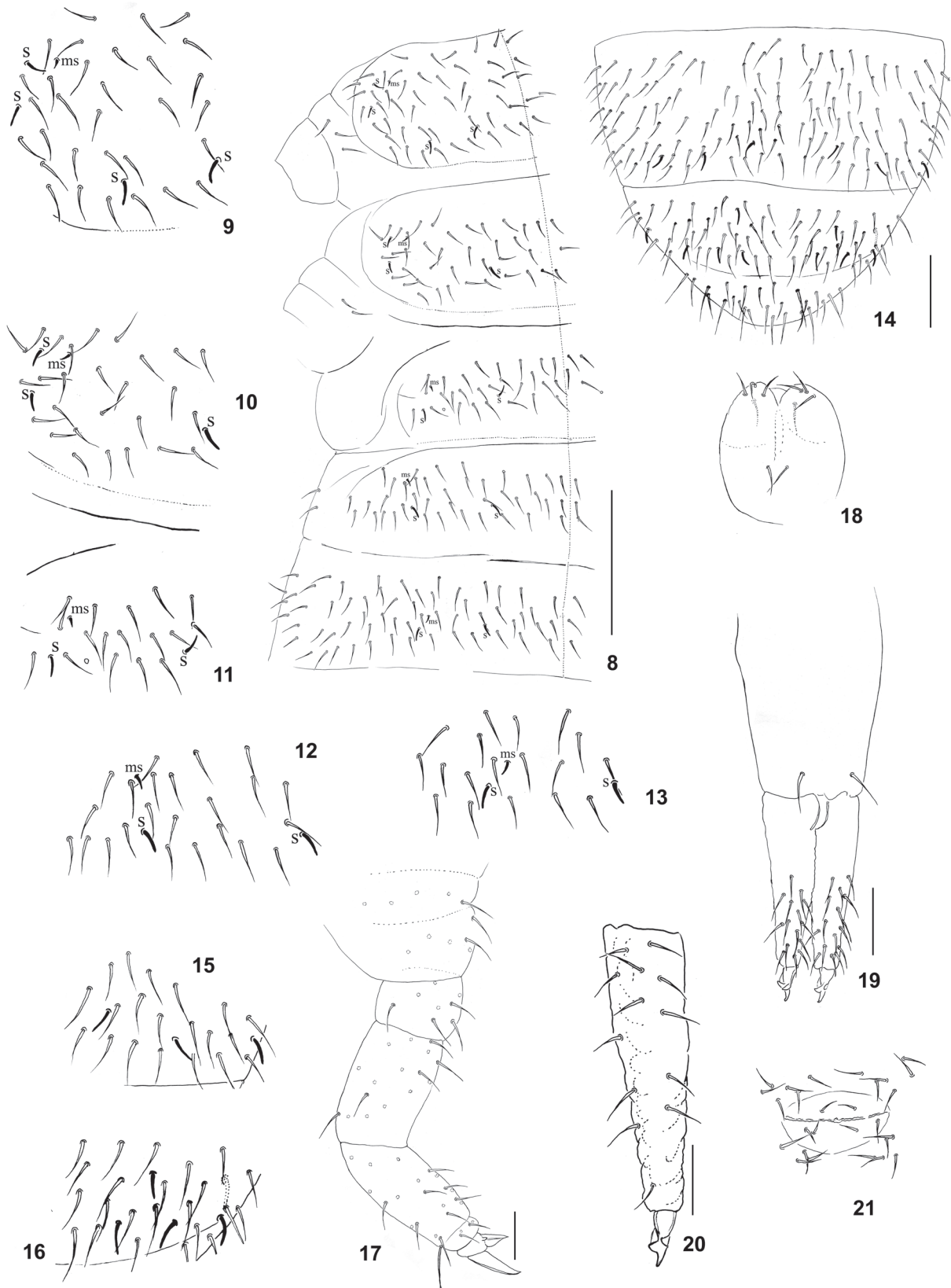
chaetae, 2 sensory rods, 2 guard sensilla and 1 short external sensillum, without basal ms. Ant II with about 20 ordinary chaetae, 1 latero-external sensillum, 3 basal ms, 1 dorsal and 2 ventral (Fig. 3). Ant I with 11 ordinary chaetae, 2 unequal sensilla and 2 basal ms, 1 ventral and 1 dorsal



Figure 2. Specimens of *Scutisotoma micha* n. sp. in ethanol. These specimens were photographed under a stereomicroscope. So this figure show the coloration and habitus of the new species.



Figures 3–7. *Scutisotoma misha* n. sp. (3) antennal segment II, dorsal view; (4) antennal segments I–IV, dorsal view (from different specimen); (5) labral chaetae; (6) maxillary outer lobe; (7) labial palp. Scale bars: 10 μ m (Figs 6–7), 20 μ m (Figs 3–4).



Figures 8–21. *Scutisotoma misha* n. sp. (8) chaetotaxy of Th. II – Abd. III; (9–13) lateral parts of Th. II, III, Abd. I, II, III respectively; (14) chaetotaxy from Abd. IV–V, dorsal view; (15–16) lateral parts of Abd. IV, V respectively; (17) leg III; (18) ventral tube, posterior view; (19) furca, anterior view; (20) dens and mucro, posterior view; (21) female genital plate. Scale bars: 20µm (Figs 17–20), 30µm (Fig. 19), 50µm (Fig. 14), 100µm (Figs 8–13).

(Fig. 4). Ratio antennal segments: I: II: III: IV = 1: 1,4: 1,6: 2,8. Labrum with 4 prelabral and 5,5,4 labral chaetae; anterior row inserted on papillae (Fig 5). Maxillary outer lobe with simple palp and 4 sublobal hairs (Fig. 6). Labium with a full set of papillae, 1 lateral process and 15 guard chaetae. Papilla E without guard chaeta e_7 . Hypostomal chaetae H, h1 and h2 subequal. Mentum with 3 proximal and 5 basolateral chaetae and submentum with 4 basomedian chaetae (Fig. 7). Head with 3 + 3 axial chaetae ventrally.

Body chaetae smooth and subequal. Macrochaetae not distinguishable even laterally. Dorsal axial chaetae of Th. II – Abd. V as 5,3/3,3,3,6-8,4 by half tergite. Sensillary chaetotaxy as 4,3/2,2,2,3,5 (s) and 1,1/1,1,1 (ms) by half tergite. Sensillary pattern on Th. II – Abd. III according figures 8-13. Microsensillum on Abd. I – III in front of lateral sensillum. Sensillary pattern on Abd. IV – VI according figure 14. Abd. IV with 3 + 3 sensilla situated in front of p-row of chaetae (Fig. 15) and Abd. V with 5 + 5 sensilla, 3 + 3 dorsal arranged in a triangle, 1 + 1 in lateral and 1 + 1 in ventral (Fig. 16). Macrosensilla of subequal size. Ventral side of thorax without chaetae.

Appendages. Unguis simple, without teeth; unguiculus lanceolate. Tita I, II, III with 19-20, 20-23, 25 chaetae. Femur I, II, III with 12, 15-16, 15-16 chaetae. Trochanter I, II, III, with 9, 9-10, 8-9 chaetae. B-row on Tita I-II with 7 chaetae (complete). Tita with 1-1-1 spatulate tenent chaetae (Fig. 17). Ventral tube with 4 + 4 laterodistal and 2 posterior chaetae (Fig. 18). Tenaculum 4 + 4 teeth and one chaeta. Anterior furcal subcoxae with 6-13 and posterior furcal subcoxae with 6-9 chaetae. Manubrium with 1 + 1 anterior, about 14 + 14 posterior chaetae and no lateral chaetae. Dens long with 15-16 anterior chaetae in distal half (Fig. 19), posterior side notched, with 12-13 chaetae, one of them near mucro

(Fig. 20). Mucro with 3 teeth and lateral lamellae. Ratio manubrium: dens: mucro about as 6: 4,9: 1. Genital plate of female according Figure 21.

Etymology. In Russia, the nickname Misha is typically used to affectionately call people named Mikhail. Thus, the name of the species is a tribute to Mikhail Potapov for his great contribution to the knowledge of Isotomidae.

3.2 Discussion

The genus *Scutisotoma*, as currently characterized by Potapov et al. (2006), has consistent taxonomic characters related to sensillary pattern (s, ms), chaetotaxy on antennae, tibiotarsi, maxillary palp, labial palp, and others. This genus includes 33 nominal species, among which 26 were classified by Huang & Potapov (2012) into three groups based on maxillary palp and prelabral chaetae: *schisti* group (bifurcated maxillary palp, four prelabral chaetae), *subarctica* group (simple maxillary palp, three prelabral chaetae) and *christianseni* group (simple maxillary palp, four prelabral chaetae).

The new species diverges from *S. subarctica* regarding prelabral chaetae (4 vs 3), sensillary set 5,4/3,3,3,3,5 vs 4,4/3,3,3,2,4 (s + ms), chaetae on ventral tube (4 + 4 laterodistal, 2 posterior vs 3 + 3 laterodistal, 3-4 posterior), chaetae on dens (15-16 anterior, 12-13 posterior vs 6-7 anterior, 7-8 posterior), tenent chaetae on tibiotarsi (1,1,1 vs 1,2,2) and color pattern (brownish vs bluish). If we compare *Scutisotoma misha* n. sp to *S. christianseni*, there are differences regarding the following set of characters: color pattern (brownish vs bluish black), body length (0.86 mm vs 1.8 mm), guard chaetae on labial papilla E (6 vs 7) and tenent chaetae on tibiotarsi (1,1,1 vs 1,2,2) (Tab. 1).

Table 1. Distinguishing characters between *Scutisotoma misha* n. sp. and similar species.

Characters	<i>S. subarctica</i> (Gisin, 1950)	<i>S. christianseni</i> (Stach, 1959)	<i>S. misha</i> n. sp.
Body length	1 mm	up to 1.8 mm	0.75–0.86 mm
Color pattern	bluish black	blue	brownish
Axial formula	6,4/3,3,3	?	5,3/3,3,3,6–8,4
Basal microsensilla on Ant. III	?	present	absent
Prelabral chaetae	3	4	4
Sublobal hairs	4	4	4
Guard chaetae on labial papilla E	6	7	6
Tergal microsensilla	1,1/1,1,1	1,1/1,1,1	1,1/1,1,1
Tergal macrosensilla	3,3/2,2,2,2,4	3,3/2,2,2,2,4	4,3/2,2,2,3,5
Ventral tube chaetae	3 + 3 laterodistal 3–4 posterior	about 7 + 7 laterodistal 4–6 posterior	4 + 4 laterodistal 2 posterior
Retinaculum chaetae	1–2 chaetae	1 chaeta	1 chaeta
Tenent chaetae on tibiotarsi	1,2,2 spatulate	1,2,2 spatulate	1,1,1 spatulate
Dens anterior chaetae	6–7	9	15–16
Dens posterior chaetae	7–8	11	12–13
Distribution	Palaearctic	Palaearctic	Neotropic

Extend in the comparison of *Scutisotoma misha* n. sp. to members of the *Proisotoma* complex, we found similarities with species from the *minuta* group (= *Proisotoma* s.str.) regarding the simple maxillary palp and absence of basal microsensillum (bms) on Ant. III and with *P. tenella* (Reuter, 1895), *P. ripicola* Linnaniemi, 1912, *P. ramosi* Arlé, 1959 and *P. douglasi* Mendonça et al. 2015 (all these species form a specific group related to *Scutisotoma*), regarding the presence of 5 sensilla on Abd. V. However, only in *P. ramosi* this number of sensilla is the same in the Th. II and Abd. V, as seen in the new species. This peculiarity, associated to a set of characteristics like 6 guard chaetae on labial papilla E, Ant. III without bms and one spatulate tenent chaetae on tibiotarsi, make *Scutisotoma micha* n. sp. a reliable taxon.

We believe that the description of new forms species the southern hemisphere can clarify the taxonomy about this new species and remove it from its current intermediate position between species of *christianseni* group and the species of *Proisotoma* complex.

4. Acknowledgments

We are grateful to Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPQ) for providing Maria Cleide de Mendonça with a grant (process 307644/2015-4), to Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for the scholarship provided for Tatiana Cristina da Silveira, to Gabriel Costa Queiroz for providing a photograph of the type locality and Nilber Gonçalves da Silva by identification of plant species from type locality.

5. References

- Arlé, R. & M. C. Mendonça (1982): Estudo preliminar das espécies de *Dicranocentrus* Schött, 1893, ocorrentes no Parque Nacional da Tijuca, Rio de Janeiro (Collembola). – *Revista Brasileira de Biologia* **42**(1): 41–49.
- Bagnall, R. S. (1949): Contributions towards a knowledge of the Isotomidae (Collembola) I–VI. – *Annals and Magazine of Natural History* **12**(1): 529–541.
- Bellinger, P. F., K. A. Christiansen & F. Janssens (2019): Checklist of the Collembola of the World [http://www.collembola.org (Accessed 31 January 2019)].
- Christiansen, K. A. & P. F. Bellinger (1980): The Collembola of North America North of the Rio Grande, Part 2. Families Onychiuridae and Isotomidae. – Grinnell College, Iowa: 387–784.
- Fjellberg, A. (1993): Revision of European and North African *Folsomides* Stach with special emphasis on the Canarian fauna (Collembola: Isotomidae). – *Entomologica Scandinavica* **23**: 453–473.
- Fjellberg, A. (1999): The labial palp in Collembola. – *Zoologischer Anzeiger* **237**: 309–330.
- Hepburn, H. R. & G. N. Ross (1964): Collembola from Mexico. – *Entomological News* **75**(8): 219–220.
- Huang, C. W. & M. Potapov (2012): Taxonomy of the *Proisotoma* complex. IV. Notes on chaetotaxy of femur and description of new species of *Scutisotoma* and *Weberacantha* from Asia. – *Zootaxa* **3333**: 38–49.
- Mendonça, M. C., G. C. Queiroz & T. C. Silveira (2015): Two new species of *Proisotoma* Börner, 1901 from Southeastern Brazil (Collembola: Isotomidae). – *Soil Organisms* **87**(1): 51–60.
- Potapov, M., A. Babenko & A. Fjellberg (2006): Taxonomy of the *Proisotoma* complex. Redefinition of genera and description of new species of *Scutisotoma* and *Weberacantha* (Collembola: Isotomidae). – *Zootaxa* **1382**: 1–74.
- Wray, D. L. (1950): A preliminary list of Collembola of Utah. – *Bulletin of the Brooklyn Entomological Society* XLV: 60–64.